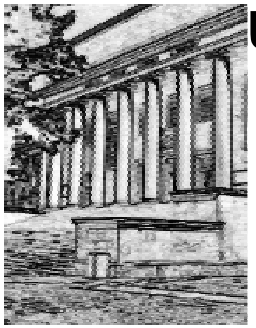
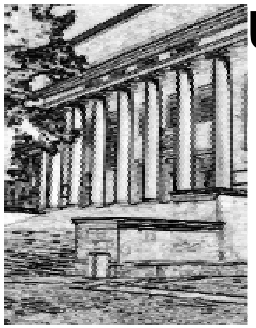


University Earth System Science (UnESS) Program

- **UnESS Project will give EQUAL weight to Science/Applications and Student Involvement**

  - **Scientific/Applications**
    - **The goals of the Earth Science Enterprise are to use the global perspective of observations from space to develop an understanding of the total Earth system and the effects of natural and human-induced changes on the global environment.**
    - **In addition, the Enterprise fosters applications research and commercial developments aimed at more pragmatic issues.**

  - **Student Involvement**
    - **To foster the development of the next generation of Earth system scientists, engineers, managers, educators, and entrepreneurs through significant and meaningful "hands-on" student involvement in Earth observation space missions at the university level.**
    - **Proposal must provide for significant and meaningful "hands-on" student involvement across a variety of university schools (e.g. engineering, science, business, journalism and communications, graphic and fine art, education, law and etc.)**

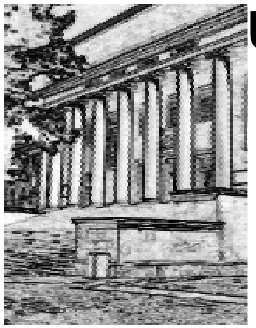


University Earth System Science (UnESS) Program

Earth Science Enterprise

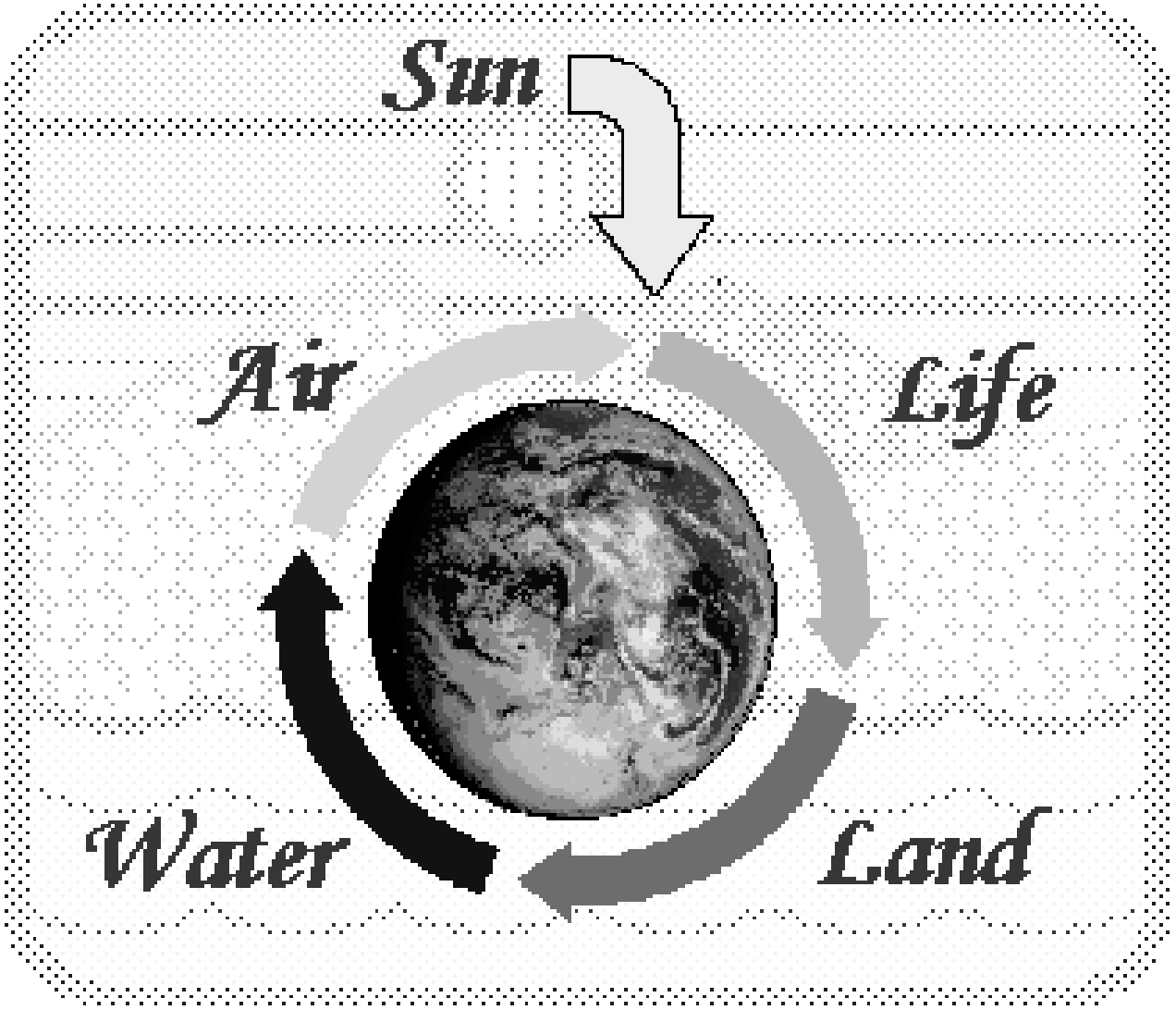
- **Science Goal: Use the global perspective of observations from space to develop an understanding of the total Earth System and the effects of natural and human-induced changes on the global environment**

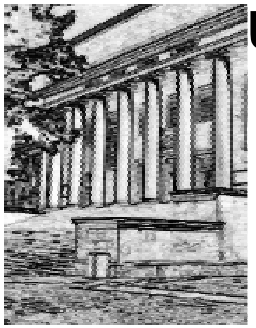
  - ***Theme Areas***:
    - **Biology and Biogeochemistry of Ecosystems and the Global Carbon Cycle**
    - **The Global Water and Energy Cycle**
    - **Climate Variability and Prediction**
    - **Atmospheric Chemistry**
    - **Solid Earth Sciences**



University Earth System Science (UnESS) Program

Earth System Science

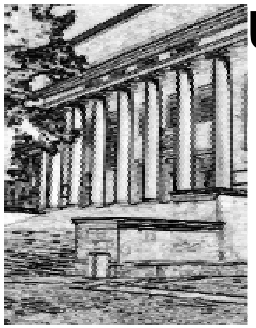




University Earth System Science (UnESS) Program

Biology and Biogeochemistry of Ecosystems and the Global Carbon Cycle

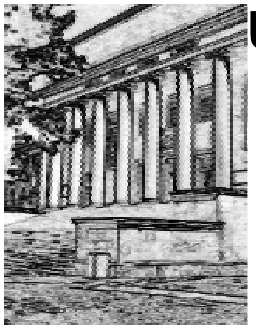
- **Use remote sensing and related technologies to understand and predict how the terrestrial and marine ecosystems are changing.**
- **Driving Questions:**
  - **How do ecosystems respond to and affect global environmental change?**
  - **How are land cover and land use changing? What are the causes and consequences?**
  - **What is the role of ecosystems in the global carbon cycle and how might it change in the future?**
- **Example observations and investigations:**
  - **intrinsic biological dynamics**
  - **processes and patters of the Earth system that affect its capacity for biological productivity**
  - **changes in land cover and land use**
  - **distribution and cycling of carbon among land, ocean, and atmospheric reservoirs**



University Earth System Science (UnESS) Program

Global Water and Energy Cycle

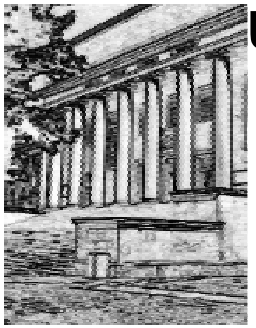
- **Use remote sensing to improve the understanding of the global water cycle to the point where useful predictions of regional hydrologic regimes can be made**
- **Driving Questions:**
  - **Is the global water cycle accelerating?**
  - **Can weather systems and hydrologic processes that control water resources be related to large-scale climate anomalies?**
  - **Can the integrated effect of fast atmospheric and surface processes be accurately represented in large-scale model predictions of climate change?**
  - **Example observations and investigations:**
  - **rates and changes in precipitation, evapotranspiration, and cloud water**
  - **water runoff, river flow, and quantities of water involved in human uses**
  - **atmospheric circulation and dynamics, radiation balance, energy sources and sinks.**



University Earth System Science (UnESS) Program

Climate Variability and Prediction

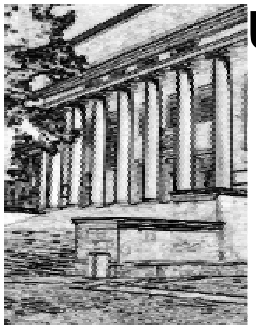
- **Use space based observations to Improve the understanding of climate mechanisms to the point where useful predictions of regional climate change can be made.**
- **Driving Questions:**
  - **Is climate changing in ways we can understand and predict?**
  - **Can the observed changes be related to specific causes or forcing factors?**
- **Example Observations and Investigations:**
  - **Ocean circulation, air-sea exchanges**
  - **sea-ice processes, mass balance of polar ice sheets**
  - **Long term radiative forcing**



University Earth System Science (UnESS) Program

Atmospheric Chemistry

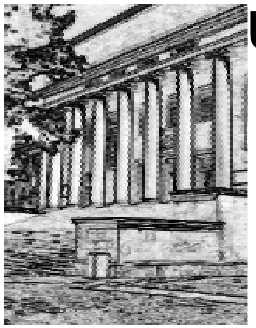
- **Measure and understand how atmospheric composition is changing in response to natural and anthropogenic forcings, and to enable accurate prediction of future changes in ozone and surface ultraviolet radiation, climate, and global pollution.**
- **Driving Questions:**
  - **Is the Montreal Protocol working as expected to stop stratospheric ozone depletion by industrially produced chemicals?**
  - **How is the distribution of trace constituents being affected by meteorological and chemical processes in the atmosphere?**
  - **How much industrial and urban pollution will expand globally and with what consequences?**
- **Example Observations and Investigations:**
  - **nature and rates of chemical processes in atmosphere**
  - **atmospheric temperature, chemical composition, and constituents**



University Earth System Science (UnESS) Program

Solid Earth Sciences

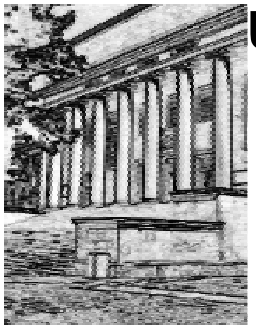
- **improve our understanding of dynamical processes of the solid Earth and their interactions with other elements of the environment including impacts on society and the assessment of natural hazards through pioneering space geodesy and remote sensing.**
- **Driving Questions:**
  - **What are the motions of the Earth's interior and what information can we infer about internal processes such as mantle convection and the generation of the Earth magnetic field?**
  - **How is the Earth's topographic surface being transformed and how can this knowledge be used to predict future changes?**
- **Example Observations and Investigations:**
  - **Static and Time-variable components of the Earth's gravity and magnetic fields**
  - **geodetic measurements for monitoring the terrestrial reference frame**
  - **length of day variations**
  - **Structure and dynamics of the Earth's interior and crust**
  - **Topography and its deformation through time**



University Earth System Science (UnESS) Program

Earth Science Enterprise

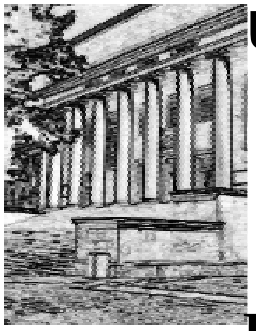
- **Applications Goal: foster applications research and commercial developments aimed at more pragmatic issues including:**
  - **Theme Areas**
    - **Food and fiber**
    - **Natural Resources**
    - **Disaster Management**
    - **Environmental Quality**
    - **Urban and Infrastructure**
    - **Human Health and Safety**



University Earth System Science (UnESS) Program

Applications Themes

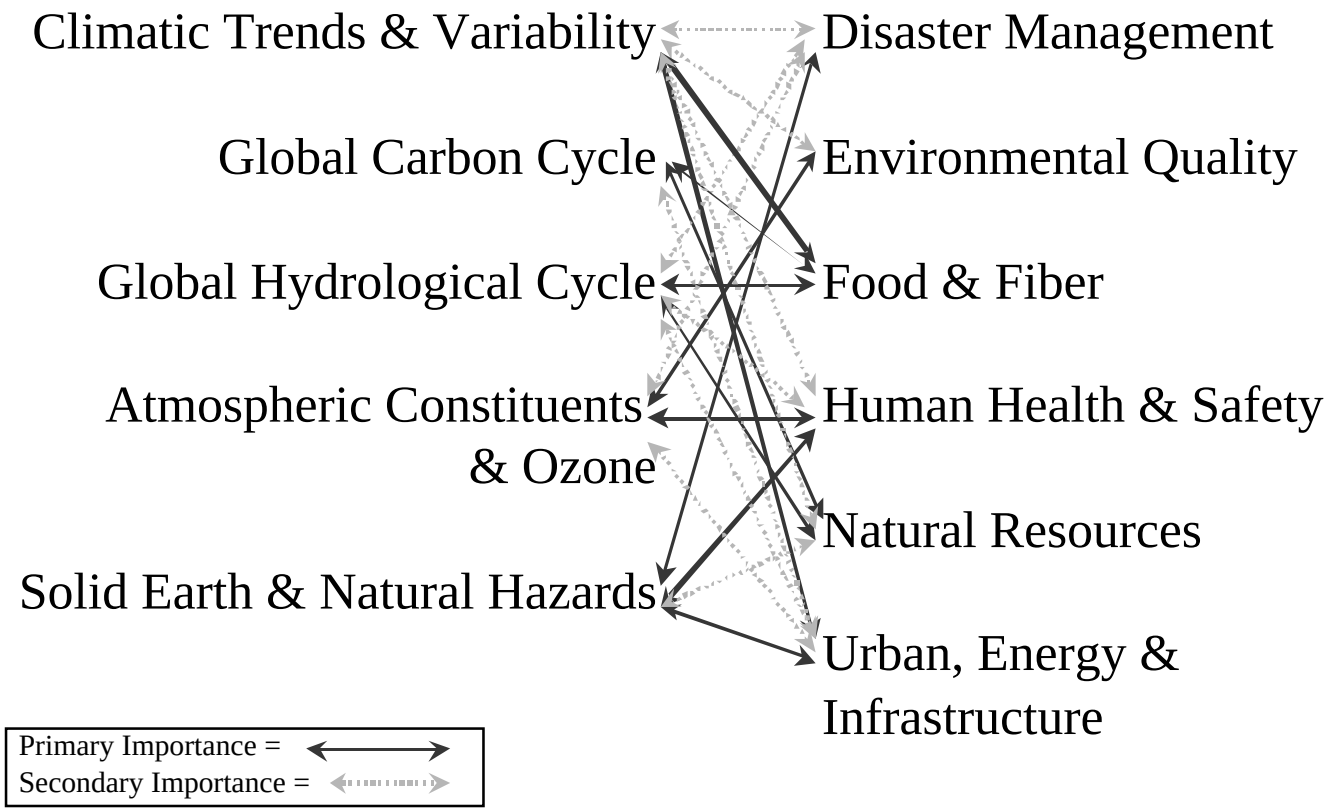
- **Food and Fiber**
  - **e.g., precision agriculture, pest control, forestry, rangelands**
- **Natural Resources**
  - **e.g., Land use/cover , wetlands, mineral/energy exploration and extraction, recreation, water resources, wildlife management, bio-diversity, coastal and ocean systems**
  - **Disaster Management**
  - **Earthquakes, volcanic eruptions, ash clouds, landslides, coastal hazards, wildfires, flooding, severe storms**
- **Environmental Quality**
  - **Air quality, tropospheric ozone, water quality, soils, abandoned mines, electromagnetic energy, contingency spill events, urban heat islands**
  - **Urban and Infrastructure**
  - **Growth management, urban and regional planning, infrastructure planning,**
- **Human Health and Safety**
  - **Public health, vector-borne and infectious diseases**

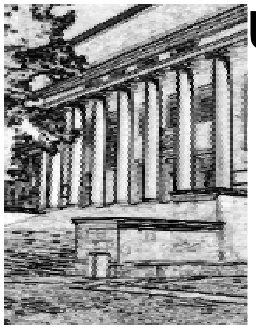


University Earth System Science (UnESS) Program

Science/Application Mapping

ESE Science Themes **ESE Application Themes**

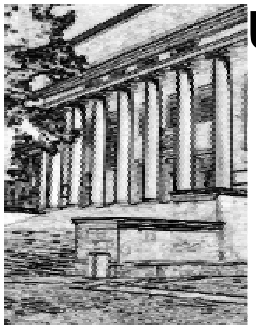




University Earth System Science (UnESS) Program

Student Involvement Requirements

- **This Announcement of Opportunity is intended to foster the development of the next generation of Earth system scientists, engineers, managers, educators, and entrepreneurs through *significant and meaningful HANDS-ON student involvement* in Earth observations at the University level.**

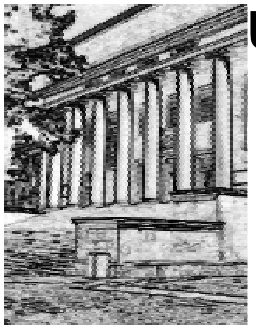


University Earth System Science (UnESS) Program

Student Involvement Requirements:

- **Must be enrolled in accredited university educational program with the intention of obtaining a degree.**
- **Meaningful participation in all aspects of project.**
  - **e.g., preparation of proposals, concept and instrument development, mission operations, data analysis and distribution, debriefings, etc.**
  - **Includes a broad range of fields:**
  - **e.g., science, engineering, aerospace management, business, journalism, education, graphic and fine arts, law, communications, etc.**
  - **Participation from HBCU and other minority Universities**

Significant and Meaningful HANDS-ON student involvement



University Earth System Science (UnESS) Program

Other Opportunity Criteria

- **Educational Outreach (over and above the direct student involvement)**
- **Public Outreach**
- **Participation by HBCU and OMU's**
- **Commercial Opportunities**